

## **Production and properties of solid biochar from oil palm trunk waste using sub-critical water technology**

### **ABSTRACT**

Sub-critical water (sub-CW) technology was utilised to produce solid biochar (SB) from oil palm trunk (OPT). This study evaluated the production of SB from sub-CW treatment of the top and bottom parts of 21- and 35-year old OPT. The SB production and its properties were assessed by means of higher heating values, elemental analysis, scanning electron microscopy, and particle size distribution. Treatment of the OPT21T at 300°C for 5 min produced a high yield of SB at 0.18 kg kg-dry OPT<sup>-1</sup>. The highest higher heating value (HHV) of SB was 32.4 MJ kg<sup>-1</sup> from the treatment of OPT21B at 340°C for 5 min. The SB had higher HHV than petroleum coke but was within the range of general-purpose coal. Elemental analysis of SB revealed the occurrence of carbonisation and the extent of pyrolysis reaction judging from increasing the carbon value of SB with increasing temperature. The particle size distribution of SB at 370°C and 5 min reaction time was in the range between 8 and 10 µm. Consequently, sub-CW is a promising technology to convert waste oil palm trunks into micro-particle SB with high HHV for possible use as alternative fuel and for improving soil productivity.

**Keyword:** Sub-critical water (sub-CW) technology; Pyrolysis; Oil palm trunk; Solid biochar (SB); Micro-particle biochar